UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RADIATION AND INDOOR AIR
National Air and Radiation Environmental Laboratory
540 South Morris Avenue, Montgomery, AL 36115-2601
(334) 270-3400

April 20, 2004

MEMORANDUM

SUBJECT: Radiochemical Results for HIMCO Dump Samples

FROM: John Griggs, Chief
Monitoring and Analytical Services Branch

TO: Larry Jensen, Health Physicist
Region 5

Attached is a data package for gamma analysis of samples collected from the HIMCO Dump Site in Elkhart, IN. The samples constitute NAREL batch number 0400010.

Radiochemical analyses usually require the subtraction of an instrument background measurement from a gross sample measurement. Both values are positive, but when the sample activity is low, random variations in the two measurements can cause the gross value to be less than the background, resulting in a measured activity less than zero. Although negative activities have no physical significance, they do have statistical significance, as for example in the evaluation of trends or the comparison of two groups of samples.

For all analyses except gamma spectroscopy, it is the policy of NAREL to report results as generated, whether positive, negative, or zero, together with the 2-sigma measurement uncertainty and a sample-specific estimate of the minimum detectable concentration (MDC). The activity, uncertainty, and MDC are given in the same units. The activity and 2-sigma uncertainty for a radionuclide measured by gamma spectroscopy are reported only if the nuclide is detected; so, the results of gamma analyses are never zero or negative. Nuclides that are not detected do not appear in the report, with the exception of Ba-140, Co-60, Cs-137, I-131, K-40, Ra-226, and Ra-228. If one of these seven nuclides is undetected, NAREL reports it as "Not Detected," or "ND," and provides a sample-specific estimate of the MDC.

Specific information concerning all aspects of the radiological analysis of the samples is contained in the batch case narratives of the data packages. If you have any questions concerning the analytical results, please contact me at (334)270-3450.

Attachments

cc: Jack Barnette, Region 5, w/o attachments
Steve Ostrodka, SF, Region 5, w/o attachments
Mary Clark, (6601J), w/o attachments
Ed Sensintaffar, NAREL

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES

REPORT OF SAMPLE DELIVERY GROUP #0400010

Project: HIMCO DUMP
Analysis Procedure: Gamma Spectrometry
Date Reported: 04/15/2004

SAMPLES

NAREL Sample #	Client Sample ID	Type	Matrix	Date Collected	Date Received
A4.01624K	TRENCH E OF CDA, #1	SAM	SOIL	03/18/2004	04/02/2004
A4.01625L	TRENCH E OF CDA, #2	SAM	SOIL	03/18/2004	04/02/2004

EXCEPTIONS

1. Packaging and Shipping - No problems were observed.
2. Documentation - No problems were observed.
3. Sample Preparation - No problems were encountered.
4. Analysis - No problems were encountered.
5. Holding Times - All holding times were met.

QUALITY CONTROL

1. QC samples - All QC analysis results met NAREL acceptance criteria.
2. Instruments - Response and background checks for all instruments used in these analyses met NAREL acceptance criteria.

CERTIFICATION

I certify that this data report complies with the terms and conditions of the Quality Assurance Project Plan, except as noted above. Release of the data contained in this report has been authorized by the Chief of the Monitoring and Analytical Services Branch and the NAREL Quality Assurance Coordinator, or their designees, as verified by the following signatures.

Mary Wisdom 4/20/04
Mary F. Wisdom Date
Quality Assurance Coordinator

John Griggs 4/19/04
John Griggs, Ph.D. Date
Chief, Monitoring and Analytical Services Branch

GENERAL INFORMATION

SAMPLE TYPES

BLD	Blind sample
FBK	Field blank
SAM	Normal sample

ANALYSIS QC TYPES

ANA	Normal analysis
DUP	Laboratory duplicate
LCS	Laboratory control sample (blank spike)
MS	Matrix spike
MSD	Matrix spike duplicate
RBK	Reagent blank

QUALITY INDICATORS

RPD	Relative Percent Difference
%R	Percent Recovery
Z	Number of standard deviations by which a QC measurement differs from the expected value

EVALUATION OF QC ANALYSES

A reagent blank result is considered unacceptable if it is more than 3 standard deviations below zero or more than 3 standard deviations above a predetermined upper control limit. For some analyses NAREL has set the upper control limit at zero. For others the control limit is a small positive number.

NAREL evaluates the results of duplicate and spike analyses using "*Z* scores." A *Z* score is the number of standard deviations by which the QC result differs from its ideal value. The score is considered acceptable if its absolute value is not greater than 3.

The *Z* score for a spiked sample is computed by dividing the difference between the measured value and the target value by the combined standard uncertainty of the difference.

The *Z* score for a duplicate analysis is computed by dividing the difference between the two measured values by the combined standard uncertainty of the difference. When the precision of paired MS/MSD analyses is evaluated, the native sample activity is subtracted from each measured value and the net concentrations are then converted to total activities before the *Z* score is computed.

Each standard uncertainty used to compute a *Z* score includes an additional fixed term to represent sources of measurement error other than counting error. This additional term is not used in the evaluation of reagent blanks.

NAREL reports the "relative percent difference," or RPD, between duplicate results and the "percent recovery," or %R, for spiked analyses, but does not use these values for evaluation.

GENERAL INFORMATION (CONTINUED)

GAMMA ANALYSIS

The reporting format lists the gamma emitters in alphabetical order. The activity and 2-sigma uncertainty for radionuclides measured by gamma spectroscopy are reported only if the nuclide is detected. Nuclides that are not detected do not appear in the report, with the exception of Ba-140, Co-60, Cs-137, I-131, K-40, Ra-226 and Ra-228. *If one of these seven nuclides is undetected, NAREL reports it as "Not Detected" or "ND", and provides a sample-specific estimate of the MDC.*

Due to potential spectral interferences and other possible problems associated with the determination of the activity of certain radionuclides, the activities for Bi-214, Pb-214, Th-234, Pa-234m, Ra-226, Th-231, and U-235 are subject to greater possible uncertainty than other commonly reported radionuclides. It should be noted that this potential uncertainty is not included in the two-sigma counting uncertainty which is reported with each activity. Although in this report we do provide the calculated activities for these radionuclides, we recommend that the results be used only as a qualitative means of indicating the presence of these radionuclides and not as a quantitative measure of their concentration. The results for these nuclides are not used in the evaluation of quality control samples. Furthermore, because of mutual interference between Ra-226 and U-235, NAREL's gamma analysis software tends to overestimate the amounts of these nuclides whenever both are present in a sample. Lower estimates for Ra-226 activities can be obtained from the reported activities of its decay products, Pb-214 and Bi-214, which are likely to be somewhat less than the Ra-226 activity because of the potential escape of radon gas.

NAREL's gamma spectroscopy software corrects activities and MDCs for decay between collection and analysis, but only up to a limit of ten half-lives. So, if the decay time for a sample is more than ten half-lives of a radionuclide, that nuclide will almost always be undetected and the reported MDC will be meaningless. This is usually a problem only for short-lived radionuclides, such as I-131 and Ba-140, when there is a long delay between collection and analysis.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #0400010

ANALYSIS SUMMARY

Analysis Procedure: NAREL GAM-01
Title: Gamma Spectrometry

NAREL Sample #	QC Type	Preparation Procedure	Date Completed	Prep Batch #	QC Batch #
A4.01624K		N/A	04/08/2004	0008558W	0003210M
A4.01625L		N/A	04/08/2004	0008558W	0003210M
A4.01625L	DUP	N/A	04/10/2004	0008558W	0003210M

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #0400010

SAMPLE ANALYSIS REPORT

Sample #:	A4.01624K	QC batch #:	0003210M
Matrix:	SOIL	Prep batch #:	0008558W
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.590e+03 GDRY	Analysis procedure:	NAREL GAM-01
Dry/wet weight:	N/A	Analyst:	RCL
Ash/dry weight:	N/A	QC type:	ANA

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
04/07/2004 12:44	1000.0	GE17	RCL

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140	ND		9.7e-02	PCI/GDRY	03/18/2004
Bi212	9.99e-01	9.2e-02		PCI/GDRY	03/18/2004
Co60	ND		1.2e-02	PCI/GDRY	03/18/2004
Cs137	2.44e-02	5.1e-03		PCI/GDRY	03/18/2004
I131	ND		5.1e-02	PCI/GDRY	03/18/2004
K40	1.52e+01	8.7e-01		PCI/GDRY	03/18/2004
Pb212	9.80e-01	5.7e-02		PCI/GDRY	03/18/2004
Ra223	6.73e-02	3.1e-02		PCI/GDRY	03/18/2004
Ra224	5.59e-01	1.2e-01		PCI/GDRY	03/18/2004
Ra228	9.57e-01	5.7e-02		PCI/GDRY	03/18/2004
Rn219	9.03e-02	2.7e-02		PCI/GDRY	03/18/2004
Tl208	3.20e-01	1.9e-02		PCI/GDRY	03/18/2004

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #0400010

SAMPLE ANALYSIS REPORT

Sample #:	A4.01625L	QC batch #:	0003210M
Matrix:	SOIL	Prep batch #:	0008558W
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.160e+03 GDRY	Analysis procedure:	NAREL GAM-01
Dry/wet weight:	N/A	Analyst:	RCL
Ash/dry weight:	N/A	QC type:	ANA

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
04/07/2004 12:45	1000.0	GE18	RCL

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140	ND		1.2e-01	PCI/GDRY	03/18/2004
Bi212	1.93e+00	1.4e-01		PCI/GDRY	03/18/2004
Co60	ND		9.6e-03	PCI/GDRY	03/18/2004
Cs137	1.30e-02	6.0e-03		PCI/GDRY	03/18/2004
I131	ND		6.4e-02	PCI/GDRY	03/18/2004
K40	2.29e+01	1.3e+00		PCI/GDRY	03/18/2004
Pb210	1.22e+00	3.2e-01		PCI/GDRY	03/18/2004
Pb211	3.33e-01	2.2e-01		PCI/GDRY	03/18/2004
Pb212	1.86e+00	1.1e-01		PCI/GDRY	03/18/2004
Ra223	5.26e-01	5.2e-02		PCI/GDRY	03/18/2004
Ra224	1.47e+00	1.9e-01		PCI/GDRY	03/18/2004
Ra228	1.87e+00	1.1e-01		PCI/GDRY	03/18/2004
Rn219	1.50e-01	4.5e-02		PCI/GDRY	03/18/2004
Th227	1.48e-01	3.3e-02		PCI/GDRY	03/18/2004
Tl208	5.63e-01	3.3e-02		PCI/GDRY	03/18/2004

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #0400010

SAMPLE ANALYSIS REPORT

Sample #:	A4.01625L	QC batch #:	0003210M
Matrix:	SOIL	Prep batch #:	0008558W
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.160e+03 GDRY	Analysis procedure:	NAREL GAM-01
Dry/wet weight:	N/A	Analyst:	RCL
Ash/dry weight:	N/A	QC type:	DUP

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
04/09/2004 15:10	1000.0	GE17	RCL

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140	ND		1.4e-01	PCI/GDRY	03/18/2004
Bi212	1.79e+00	1.5e-01		PCI/GDRY	03/18/2004
Co60	ND		1.8e-02	PCI/GDRY	03/18/2004
Cs137	1.24e-02	6.5e-03		PCI/GDRY	03/18/2004
I131	ND		7.7e-02	PCI/GDRY	03/18/2004
K40	2.30e+01	1.3e+00		PCI/GDRY	03/18/2004
Pb212	1.83e+00	1.1e-01		PCI/GDRY	03/18/2004
Ra224	1.53e+00	2.0e-01		PCI/GDRY	03/18/2004
Ra228	1.69e+00	9.9e-02		PCI/GDRY	03/18/2004
Rn219	2.29e-01	6.2e-02		PCI/GDRY	03/18/2004
Tl208	5.51e-01	3.3e-02		PCI/GDRY	03/18/2004